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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,596	10/03/2003	David E. Spence	18120-0025	6162

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EXAMINER	
NGUYEN, TUAN N	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 05/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

SM

Office Action Summary	**Application No.** 10/678,596	**Applicant(s)** SPENCE ET AL.	
	Examiner Tuan N. Nguyen	**Art Unit** 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 October 2003*.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.
  4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-48* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on *03 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
  Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
  Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  a)☐ All b)☐ Some * c)☐ None of:
    1.☐ Certified copies of the priority documents have been received.
    2.☐ Certified copies of the priority documents have been received in Application No. _____.
    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
  * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
  Paper No(s)/Mail Date *04/25/05; 03/08/04*.
4) ☐ Interview Summary (PTO-413)
  Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 33-38 objected to under 37 CFR 1.75(c), as being of improper dependent form, for lack proper antecedent.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or non-obviousness.

3. Claims 1, 2, 5-9, 10, 39-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews et al. (US 5363391) in view of Byren et al. (US 6330256).

With respect to claims 1 and 39, 45 Matthews et al. '391 discloses and shows a conductive face-cooled laser crystal having a source and gain medium, such that it can be pumped as amplifier (ABSTRACT) (Col 2: 1-10), with solid cooling element contact with gain medium (Fig 1: 13,14), where a mounting apparatus that holds the solid cooling element to the gain medium (Fig 1: 11) (Col 3: 10-65). Matthews '391 however did not discretely disclose the cooling element in physical contact but not bonded to the surface of the gain element. Byren et al. '256 shows and discloses face-cooling scheme for crystal having solid cooling element, a mounting apparatus, and the gain crystal can be cement bonded, diffusion-bonded, or optically contact. It would have been obvious to one of ordinary skill in the art to provide Matthews et al '391 the element as taught or suggested by Byren et al. '256, the laser cooling scheme without bonding the cooling surface and the gain element, to reduce stress on the gain laser system. Since claim 39 recites the same or identical elements/limitations it is inherent to use patents ('391) and ('256) to recite the method of removing heat from gain medium of an optical system, product by process.

With respect to claims 2,5 Matthews et al. '391 discloses the optical system is a laser and amplier (ABSTRACT) (Col 2: 1-10).

With respect to claims 6, 7, 10, 40-44 Matthews et al. '391 discloses there are two cooling surfaces and two cooling elements (Fig 1: 13, 13a) (Col 2: 15-20)(Col 3: 30-50), and the heat flow substantially 1 direction (Col 5: 1-10). It is inherently obvious, that when the cooling element and gain element are not bonded together, there are forces use to hold the two elements together, in this case forces substantially to the cooling surfaces, to reduce high temperature. Since the cooling elements are not bonded to the gain medium, the expansion or reduction due to heat, will not cause stress or strain and fracture the gain material.

With respect to claims 8, 9 the claims further require gain medium is a thin disk with a cross-section thickness ration is greater 10. A change in size, in this case the thickness of the gain medium, is generally recognized as being within the level of ordinary skill in the art. *In re Rose, 105 USPQ 237 (CCPA 1955).*

4. Claims 3, 4, 26, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews et al. (US 5363391) in view of Byren et al. (US 6330256) further in view of Lee et al. (US 6683894).

Matthews '391 and Byren '256 disclose the above, the claims further require the laser is a Q switched or mode-locked, and the pump source is a fiber coupled diode bar or a diode stack. Lee et al. ' 894 discloses a diode pumped solid state laser having stack diode laser pump into the Yb:YAG laser (Fig 2: 12, 15) or the use of optical fiber as pump source (Fig 9: 92). Lee et al. '894 further disclose the laser operate as Q-switch (Fig 2: 19). It would have been obvious to one of ordinary skill in the art to provide Matthews et al '391 and Byren et al '256 the fiber or diode stack as pump source that operate as Q switch or mode-locked to release the high pulse energy as taught or suggested by Lee et al '894.

5. Claims 11-25, 28-38, 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matthews et al. (US 5363391) in view of Byren et al. (US 6330256) further in view of Hasson et al. (US 6667999).

With respect to claim 11, Matthews et al. '391 and Byren et al. '256 discloses the above. The claims further require that the solid cooling elements are transparent to at least one of the laser and pump wavelength. Hasson et al. ' 999 discloses the cooling of high power layer having solid cooling elements that is transparent to the laser gain or pump wavelength (Fig 2:

102, 104)(Col 2: 32-40; Col 6: 45-67). It would have been obvious to one of ordinary skill in the art to provide Matthews et al '391 and Byren et al. '256 the transparent cooling element taught or suggested by Hasson et al. '999, to cool the laser gain structure.

With respect to claims 12-15 the claims further require the solid cooling elements are sapphire, diamond, single crystal, and have thermal conductivity greater $100Wm^{-1}K^{-1}$. Hasson et al '999 discloses the use of diamond cooling crystal having heat conductivity of approximately 1350W/m-c (Col 5: 55-67). It has been held to select known material on the basis of its suitability for the intended use as a matter of obvious design choice, in this case single-crystal or sapphire are transparent crystal other than red.

With respect to claims 16-25, the claims require that the gain medium is Nd:YVO4, Yb:YAG, Yb:KGW, Yb:KYW, $Yb3^{+}$, and apatite crystal. Metthews et al. '391 discloses the laser crystal or gain structure as crystal and the like material (Col 3: 10-15). Byren et al. '256 discloses the use of Nd:YAG laser, birefringent crystal, MgF_2 and possible others (Col 7: 10-65)(Col 8: 1-30)(ABSTRACT), and Hasson et al. '999 discloses the use of Nd:YAG laser and possible others related type (Col 5: 5-20). It has been held to select known material on the basis of its suitability for the intended use as a matter of obvious design choice, in this case the type of doping or gain medium.

With respect to claims 28-30, Byren et al. '256 discloses the cooling element is liquid or gel cool, dry stack, bonded, or contact for cooling (ABSTRACT).

With respect to claims 31-32, 46-48 Matthews et al. '391 disclose the use dielectric spacer, shim, or thin film coating between the gain medium and cooling element (Col 3: 30-35; 43-60), and it is within one skill in the art to increase the thickness of the layer to increase the heat dissipation such as in multi-layer of dielectric, or allow gain medium expansion if over heat (Fig 1: 14, Spacer).

With respect to claims 33-38, Matthews et al. '391 discloses thin film coating between the gain medium and cooling element (Col 3: 30-35; 43-60), and it is within one skill in the art to recognize that Q switching or mode-locking laser oscillate within reflectives such that when the light reaches a certain level that permitting the release of all energy store in the crystal, therefore it is inherently obvious that the thin film coating could be made out from any material or coating such as high reflective or anti reflective, to keep the resonating light within the crystal until the desire level has been reach to release the stored energy.

Communication Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan N Nguyen whose telephone number is (571) 272-1948. The examiner can normally be reached on M-F: 7:30 - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harvey Minsun can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tuan N. Nguyen

Tuan Nguyen

MINSUN OH HARVEY
PRIMARY EXAMINER